Program Overview

Radiological and Nuclear Countermeasures Program

Lawrence Livermore National Laboratory

The goal of the Lawrence Livermore National Laboratory's Radiological and Nuclear Countermeasures Program is to develop, demonstrate and deploy technologies and systems to counter unconventional radiological and nuclear threats to the U.S.

We seek to serve as a bridge from inspiration to implementation by combining innovations in science and engineering with insights gained through end-to-end systems studies of threat scenarios.

These activities reside within the Non-proliferation, Arms Control, and International Security Directorate (NAI) and the Homeland Security Organization (HSO) at the Lawrence Livermore National Laboratory.

Our primary customers are the Department of Energy, the Department of Defense and the Department of Homeland Security.

Background

As a DOE national security laboratory, LLNL has a long history of supporting nuclear nonproliferation and national security policy.

As part of its mission of maintaining the U.S. nuclear deterrence, LLNL has developed world-class expertise in nuclear science, bioscience, engineering and systems analysis.

These capabilities have been applied in support of counter-terrorism and homeland security applications for over 25 years. Long-standing efforts include our role in the NEST teams, the Nuclear Assessment Program and the Radiological Assistance Program.

Recently our research and development efforts have accelerated as part of the increased emphasis being placed on the unconventional n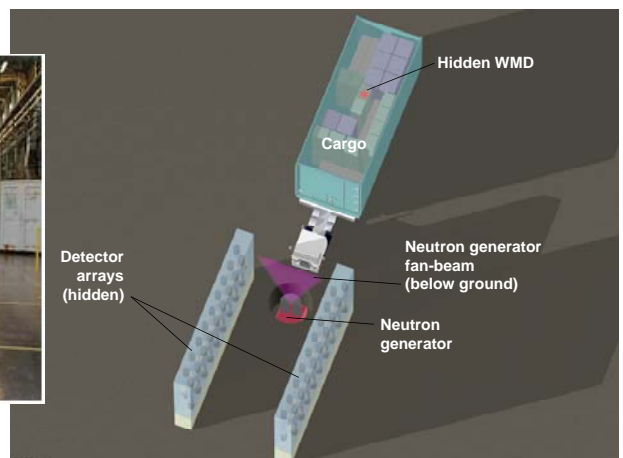uclear threat and homeland security. Over the coming months and years, we anticipate the development of greatly improved technologies and capabilities, in partnership with other National Laboratories, universities and the private sector.

Our strategy for countering radiological and nuclear threats uses a multi-layered approach. This includes:

- Securing nuclear materials worldwide
- Identifying illicit weapon production
- Monitoring borders and other areas for transport of nuclear materials
- Implementing an effective response, consequence management, and attribution system

LLNL Cargo Security Test Facility

Hidden WMD

Cargo

Detector arrays (hidden)

Neutron generator fan-beam (below ground)

Neutron generator

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Key Focus areas

We have ongoing research and development efforts in a number of key areas. Efforts are underway to:

- Use analytical models and simulations to evaluate countermeasures, and to develop defensive system architectures

- Develop new technologies and capabilities in the areas of detection, crisis and consequence management and in forensic analysis

- Deploy prototype integrated systems in real-world situations to address identified vulnerabilities

Architecture Development

LLNL analysts are applying complex analytical models, simulations, and gaming techniques to define the terrorist threat, evaluate countermeasures, develop new architectures and optimize investment. Key U.S. resource efforts involve examining the increase in security provided through the use of radiation sensors and other protective systems.

Technology development

Neutron and gamma-ray signatures form the basis for new detection systems being developed to examine cargo and monitor border crossing and roads for nuclear and radiological materials.

Present approaches involve the use of gamma-ray imaging and active interrogation systems to more easily detect the presence of radioactive materials in the sea of normal, background radiation. In addition, we are developing small detectors with improved identification capabilities for first response personnel.

Analysis of nuclear materials is also a continuing theme for forensic

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Compton imaging device, designed for high-sensitivity detection of nuclear materials

applications. We are developing new techniques to determine the isotopic composition of interdicted material. This, when combined with extensive databases and additional forensic data, aids in the attribution of illicit nuclear materials.

System demonstrations and pilot programs

Integrating new technologies into systems that can perform in real-world conditions is essential. We have ongoing efforts to demonstrate and deploy sensor systems to detect nuclear materials in vehicles and in cargo. These efforts rely not only on sensor technologies, but the technologies necessary to integrate the information into a form that can be utilized for real-time decision-making. These efforts highlight the need to provide situational awareness to the appropriate response personnel, and provide a critical link between technology development and real-world use.

Looking forward

We partner with the Department of Homeland Security, other Federal agencies and National Labs, universities and the private sector in all of these areas. Over the coming months and years, we anticipate the need to develop improved technologies, and we expect to play a role in providing these improvements.

Examples of near-term improvements include detection technologies that have greater range and will be able to more accurately identify the isotope of interest.

Threat identification and the rapid, continual deployment of new technologies into real-world systems will remain keystones in our ability to stay ahead of the terrorist threat.